

## IN CONCLUSION

Thus, of the substances tested, it would appear that merthiolate is the logical substance for emergency use, and even so too much must not be expected of it. Other substances should be used absolutely as preservatives, with complete and adequate sterility tests, not only for a time equal to federal requirements, but by methods which will give actual and not misleading results. Sterility tests with merthiolate are, for the most part, quite valueless. All such broth tests must be made with a high ratio of broth volume to serum, as high or higher than a ratio of 0.02 c.c. of 1:5,000 merthiolate preserved serum per 10 c.c. of broth, and it should be proven that broth with serum will support the growth of a very light inoculation of living organisms.

Third and Parnassus Avenues.

## DISCUSSION

K. F. MEYER, PH. D. (University of California).—The timely report by Doctor Marshall deserves consideration in the light of recent experiences. In a circular letter sent to every physician, under date of June 1, 1934, the director of the State Department of Public Health, Dr. J. D. Dunshee, quoted my statement on the preparation and use of serum in the treatment and prophylaxis of poliomyelitis. "From the standpoint of preventive medicine, it commends itself on account of its simplicity and harmlessness, provided an organization can be perfected to secure an ample supply of properly tested serum. . . . *The collection and preparation of the convalescent sera should be conducted in a central station.*" To this should have been added: "In accordance with the federal standard specified for the production and testing of sera," since it is well known that in Europe a number of fatal accidents followed the use of contaminated sera employed in the prophylaxis against measles. Unfortunately, the advice to centralize the processing of human sera was not followed. Laboratories neither equipped nor staffed with personnel experienced in handling biologics rushed into the work of handling human blood. The consequences are known through the reports in the daily press. A two-year-old boy succumbed to staphylococcal poisoning, following the intramuscular injection of a specimen of human serum contaminated with cocci. The circumstances leading to the contamination are not clear. Since the risk exists, it is obviously advisable to use a germicide which will with certainty destroy the accidental contaminants. Such a preparation is merthiolate in a dilution of 1:5000. In order to prevent the recurrence of accidents similar to that reported from Healdsburg, it will in the future be necessary to delegate the processing of human sera and the handling of biologics to laboratories selected and approved by the State Department of Public Health.

## PSITTACOSIS\*

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UNDULANT fever and tularemia, when first recognized, were considered rather rare diseases carried to man by animals; but after more careful study it was found that these infections were widely distributed and by no means so uncommon, and had simply been confused with other acute illnesses.

\* Read before the General Medicine Section of the California Medical Association at the sixty-third annual session, Riverside, April 30 to May 3, 1934.

The influenza epidemics, and various other waves of acute illness that affect the respiratory system, have probably acted as a screen to many psittacosis outbreaks, and have served to confuse the diagnosis so that this disease, too, has heretofore been considered a rarity, and has not received the study it deserves along with the other infections borne to man by animals or birds. It is by no means a new disease, as it has been recognized since the outbreak in Switzerland in 1879; and there have been many epidemics of varying proportions in the civilized world since that time, one of the most thoroughly studied outbreaks being that in Paris in 1891. From November, 1929, to May, 1930, the United States Public Health Service had records of seventy-four foci of infection giving rise to 169 cases with thirty-three deaths from psittacosis. These cases were distributed among fifteen states, and were traced to shipments of birds, belonging to the psitticine family, from widely separated tropical countries. At the same time, sporadic cases of the disease were found in practically all parts of the world. Prior to this time, however, it was practically unknown to our country; but since then, perhaps not a single month has passed without a report being made of the disease in the United States.

## ETIOLOGY

This disease evidently originated in the parrot or psitticine family of birds, and hence its name. It would be a mistake, however, to believe that the parrot alone is responsible for the spread of the virus. He probably spread it in the first place; but by now a great many of the commercial aviaries, especially in California, are involved, and many of the cage birds, especially the budgerigars, are infected, and evidence points to the fact that practically all of these birds are capable of becoming carriers. The writer has seen two human cases definitely caused by canaries.

In 1892, Nocard,<sup>1</sup> in France, isolated a bacillus from the bone marrow of a dead parrot's wing and called it the *Bacillus psittacosis*, presumably suspecting that the parrot had died of psittacosis. Several investigators isolated this organism in dead parrots, and two Frenchmen, Gilbert and Fournier,<sup>2</sup> reported having found it in the blood of a patient at autopsy, and from the parrot which had been in this person's care. Others demonstrated that this organism belonged to the *Salmonella* group, which has a proven pathogenicity for animals, including man, being in the latter a common cause of food poisoning.

During the 1929-1930 epidemic, in the United States, an intensive search was carried on by Branham, McCoy and Armstrong,<sup>3</sup> of the National Institute of Health, for the Nocard bacillus, in the carcasses and droppings of parrots, and the material from human cases shipped them, but no strain of *Bacillus psittacosis*, or of any other member of the *Salmonella* group of bacteria was found. Their work has been verified by careful investigators, and the Nocard bacillus is no longer generally considered the causative organism.

McCoy<sup>4</sup> states that between January and March, 1930, eleven cases developed in the Hygienic

Laboratory, being about 20 per cent of the persons employed in the building, while no cases developed in adjoining buildings. Some of these were only exposed so far as handling cultures of third and fourth generations, and none of these cultures were regarded as causative of the disease in bird or man. Eight others in the laboratory building, who were victims of the disease, had nothing to do with the work on psittacosis, but were merely working in the building as cleaners, night watchman, etc. No good grounds could be established for their infection.

Evidence at present points to a filterable virus being the offending agent. This theory is concurred in by Krumwiede, McCoy and Armstrong, Rivers and Berry, and Meyer in the United States, Bedson, Western and Simpson, and Gordon in England, Elkeles in Germany, Sacquepee and Ferrabouc in France and many other careful workers. The demonstration that the etiologic agent of psittacosis is a filterable virus was quickly followed by the announcement that minute bodies could be seen in suitably stained preparations of virulent human and animal material. The observations were made independently by Levinthal<sup>5</sup> (March 24, 1930), Coles<sup>6</sup> (submitted manuscript, April 3, 1930) and Lillie<sup>7</sup> (submitted manuscript, April 4). The majority of those who have worked with the psittacosis virus (Bedson and Western, Rivers and Berry, Elkeles and Barros, Meyer and Eddie), have seen and studied these elementary rickettsia-like bodies. They appear as round or oval bodies, sometimes in pairs or clusters. The latter arrangement is particularly striking, and is due to their intercellular habitat. In impression preparations or sections, the reticulo-endothelial cells are sometimes filled to the bursting point with these minute bodies. They are, therefore, probably, related to the parasitic bodies found in spotted fever and typhus, which Dr. Roche Lima has named rickettsia bodies, and which are considered forms of the virus of that disease. When present, these L. C. L. bodies (Levinthal, Coles, Lillie), as they are called by K. F. Meyer,<sup>8</sup> or rickettsia psittaci by Lillie, possess the same diagnostic value as the negri bodies in rabies.

The virus psittacosis is in the feces, and in material from nose, mouth and procrop of infected birds, and birds can be infected by intranasal instillations of this material. It is easy, therefore, to understand how this material can be scattered, after it is dried and pulverized by the agitation and flutter of wings in aviaries. Badger,<sup>9</sup> in his report of sickness in twenty-five employees in a department store which sold birds, gave histories typical of psittacosis in seventeen of them, and parrots in other sections of the country that had been obtained from the same source had caused psittacosis. His conclusions point obviously to the fact that psittacosis can be contracted by both direct and indirect contact.

The disease is highly communicable from bird to man, while instances of infection from man to man are supposedly rare; but the writer has had two cases of such transmission in the night- and day-nurse of his first case. They did not approach the birds, which were in the back yard, and one

wore a mask all of the time while on duty; yet one developed the typical disease in two weeks, and one in sixteen days. These two, however, may come under the head of "contaminated environments."

Some birds probably develop an immunity to the disease by inhaling minute doses of virus over a long period of time. Rivers'<sup>10</sup> work in experimental psittacosis indicates that parrots and rabbits that have recovered from a primary infection are refractory to reinfection.

In the human, any age is liable, and the disease seems to take a milder course in the young than in the aged. Females seem more susceptible than males, about two to one. This is probably due to the fact that there are two women to every man that handles birds.

While outbreaks appear to be most common in the winter months when other respiratory disorders are commonest, it does not mean that meteoric conditions have much bearing; but it probably means that while bird owners were having their summer vacation, they boarded their birds at aviaries, where they were exposed to the virus and then brought the infection home with them and infected their handlers. There is no record of a racial immunity.

#### SYMPTOMATOLOGY

The incubation period of the disease is generally considered to be from six to fifteen days after exposure; but some cases have developed after five and six weeks, and others have been reported as late as eighty-two days after exposure. During this period, the patient may occasionally have an anxious, nervous feeling with slight headaches.

*Onset.*—The symptoms which cause the patient to call for medical aid are fever and severe headache, accompanied by a tight feeling around the chest. The pulse is low in proportion to the temperature. It is not uncommon to find a normal pulse rate with a temperature of 104 degrees, and one patient had a good quality pulse of 90 with a temperature of 106 degrees on the sixth day of his illness. The pulse does not take a decided ascent except in the cases that prove fatal, or in which complications develop.

Respiration is only slightly affected. The temperature continues to show a decidedly irregular course throughout the disease. The tongue may have a grayish-brown heavy coating, accompanied by a bad taste in the mouth. Cough usually is associated with the onset, and is unproductive of sputum, or only slightly so. The small amount of sputum that is raised may be streaked slightly with blood, but it is not dyed with it, as in some other pulmonary diseases or ordinary pneumonia. The blood is usually due to a rupture of small blood vessels in the nose or throat, except in some very severe cases where the lungs show exudation of blood. The cough persists throughout the disease, and sometimes steadily increases in severity.

The appetite suffers at first; but later the patient eats very well. Diarrhea has been reported, but constipation is the general rule, and may reach severe proportions. The abdomen generally be-

comes distended and tender, similar to that found in typhoid the third or fourth day of illness, and remains so from ten to fifteen days.

The headache becomes progressively more severe. It is first of a basilar type, later becomes general and is quite persistent, and in some cases lasts long after convalescence. In a large number of the patients, delirium manifests itself and, like the headache, may become very troublesome.

*Physical Findings.*—The eyes are bloodshot, but no conjunctivitis or discharge from the lids is found.

The nose and throat show nothing at primary examination, although previous inflammation of these parts may have existed, and this must be kept in mind. Later in the disease they become distinctly reddened.

Herpes labialis may develop in the first few days, as in other febrile cases, but in the writer's experience it indicates a severe course. A papular eruption has appeared on the trunk in some cases, and may be limited to the back. A few rose spots, similar to those in spotted fever and typhoid, are sometimes found around the navel.

The chest must be very carefully examined if the patient is seen early, for the pulmonary changes are hard to detect from the first to the third day. At the onset, the chest shows only a diminution of breath sounds without râles or dullness on percussion; this diminution, as a rule, is found at the left base up to the angle of the scapula, posteriorly. The author's experience has revealed only two cases out of eight with the changes in the right lung. This area should be closely watched, and on the second or third day a very small patch of dry râles may be found on auscultation about in its center. After the third day, the râles spread and quickly ascend to the top of the left side. Why to the left side is not known. The raise of sputum is at no time abundant. There may be a small mass raised occasionally with coughing, which is often blood-streaked but not dyed.

*Laboratory Findings.*—The blood picture may be practically normal, or leukocytes very slightly above, up to 13,000, or they may count as low as 4,000 with a predominance of polymorphonuclears; the white cells usually drop in number steadily during the disease. There may be a shift to the left in the polymorphonuclears, and in cases showing such a distinct shift the delirium is more marked. Citrated blood taken early in the course of the disease from positive cases may reveal the virus when injected into white mice or rice-birds. Agglutination tests with *Bacillus psittacosis* and other organisms were found of no diagnostic importance by Branham. Centrifugation of the blood throws down the virus, and L. C. L. bodies may be found on prolonged search in the centrifugate.

Urinalysis, so far, has been diagnostically valueless, giving only the findings usual in febrile conditions.

Sputum may show the usual organisms that are found with routine staining, but nothing specific for the disease, per microscope; but when injected or placed in the nose of laboratory animals it will cause the disease.

Branham studied the feces, but with negative diagnostic results. No work has been done on the stomach contents. Nasal secretions from some of my cases have been examined and injected into animals by Meyer, with negative results.<sup>13</sup>

#### DIAGNOSIS

History of intimate contact with birds or patients ill with the disease must be obtained in all suspected cases before a diagnosis is possible (excepting laboratory workers employed where psittacosis material is handled, and cases giving positive animal tests). It is not necessary, however, to determine if the birds have been sick, for it must be remembered that birds can infect during the incubation of the disease in them, and that some birds are carriers and appear perfectly well. It is important to determine if any new birds have been brought into the aviary of the sick person, or one visited by him during the preceding six months, and if any of the birds have died during that time. All cage birds should be suspected, and suspicion should not be limited to the psittacine family, for the virus is now widely spread and practically all birds raised in aviculture are susceptible.

Anxiety and slight headache precede the onset by a few days. The onset is marked by severe headache and fever from 99.6 to 104 degrees Fahrenheit. The pulse is low in comparison—60 to 90. Nose-bleed may come on abruptly, and the mind is more or less clouded due to the exhaustion which is quite apparent. Cough may have been present for a time, and is dry and steadily progressive. Sputum is slight and blood-streaked, if there has been nose-bleed. In a little while all of these symptoms have increased, and the headache is the chief concern of the patient.

*Physical Findings.*—The lungs show no involvement at onset other than a diminution or absence of breath sounds generally at left base, posteriorly. Later, râles appear in this same area and spread rapidly.

Blood should be taken at once, citrated and sent to proper research laboratories, such as the Hooper Foundation, for study and animal inoculation. This also pertains to sputum and urine. These specimens should be repeatedly obtained, for it seems that upon certain days the blood yields negative results. According to Bedson,<sup>11</sup> citrated blood tested on budgerigars and mice contained in some cases the virus on the fourth, seventh, ninth and tenth days of illness; Berry found it to be absent on the third, sixth, seventh, eleventh and thirteenth days, and Gordon failed to detect it on the fourteenth day. The sputum has been found to carry the virus on the third, seventh and tenth days. These may be, however, just chance findings.

Virus is regularly obtained from lung, spleen and liver on postmortem.

In order further to substantiate diagnosis in the human, the birds suspected of transmitting the infection should be chloroformed, packed in ice and immediately shipped to the same laboratory for autopsy and inoculation tests. All material should be very carefully handled, and no attempts

at inoculation should be made, except in the best equipped laboratories, due to the great danger of infection.

#### DIFFERENTIAL DIAGNOSIS

The disease must be differentiated from typhoid, typhus, Rocky Mountain spotted fever and influenza. Rivers compares it with mild yellow fever without jaundice.

*Typhoid*.—The history of other cases of typhoid in the vicinity must be considered, then the Widal test made. If Widal is positive, careful investigation should be made concerning the previous use of typhoid vaccine upon the patient, or the history of typhoid infection. In psittacosis, the lung involvement begins almost with onset, whereas in typhoid, if pneumonia develops at all, it is later in the disease. In psittacosis the typhoid-like abdomen develops around the fourth day and lasts about twelve days, and both diseases may have rose spots around the navel, but typhoid more often.

*Typhus and Rocky Mountain Fever*.—The bite of fleas or lice and ticks should be inquired into, as should the association with birds, for these diseases are quite similar in temperature and pulse curves. Rickettsia bodies have been found in both typhus and Rocky Mountain spotted fever, and they are probably closely related to those in psittacosis. However, pneumonia appears more often and more promptly in psittacosis than in these two infections.

*Influenza*.—This disease has to be considered, but here the catarrhal symptoms are more marked. The exhaustion is not so great at onset, the cough is productive of sputum, and if pneumonia develops, it is much later in the course of the disease than is the pneumonia of psittacosis. Then the story of close contact with birds, not necessarily sick birds, is quite helpful.

#### COMPLICATIONS

Bronchopneumonia may occur at any time during the disease and cause serious complications. In a large number of patients there is a perichondrial involvement of the septum of the nose which develops late in the disease. It is possibly due to thrombosis of the delicate vessels over the septum, depriving it of circulation. In some cases this perichondritis has gone on to complete perforation of the septum. Specimens of the scrapings from such an area have been examined by K. F. Meyer, but no signs of the virus have been discovered.

Occasionally a laryngitis sicca develops, and greatly disturbs the patient.

Dysmenorrhea has been seen which lasted throughout the disease.

#### SEQUELAE

The temperature falls below normal at convalescence and is slow in rising.

Headache and inability to think clearly often persist for a considerable period after the disease.

Phlebitis of the vessels in the lower limbs may develop at any time. The writer has seen one case develop two months after the disease.

Atrophy of the legs, with decided unsteadiness of gait, has been seen by Rivers and the writer. This is quite persistent and more marked than is generally found in other febrile diseases.

#### TREATMENT

*Prophylaxis* in general consists in bird owners exercising greater care in their aviaries by keeping the dust laid in and around the aviaries with one of the calcium products sold for this purpose. All loosened feathers and other debris, as far as possible, should be burned, and above all, new birds should not be brought in from other aviaries until quite certain that the source is free from disease. If birds show signs of illness, they should be chloroformed at once and sent to a laboratory for postmortem examination.

Kissing birds, and allowing them to eat from one's dishes or from one's lips, is a vicious practice and should be stopped.

Nurses and physicians should wear masks when with the patient, and rubber gloves when handling the patient or his excretions. Tissue paper for sputum and bags for the same should be burned. Feces and urine should be treated at once with cresol.

The patient should be isolated and his surroundings very quiet, for excitement tends to make the headache and delirium worse.

Diet can and should be full, with the exception of stimulating and irritating foods.

The headache is the chief concern of the patient and requires more or less constant medication. The old familiar migraine formula of phenacetin, acetylsalicylic acid and caffeine has worked well with some cases. Narcotics may have to be used, but seldom.

Cough is the next disturbing element, and is a real tax on the therapist. The usual syrups used for this purpose are failures, and codein or other mild opiates have to be used. Where laryngitis is a complication, the cough and the laryngitis are both benefited by inhalations of steam with compound tincture of benzoin added to the water.

Unless the fever attains serious proportions, the migrain mixture used for the headache will take care of it nicely. Tepid baths may, however, be necessary to reduce it.

The heart must be watched and cardiazol, caffeine or digitalis resorted to when necessary.

There is no specific vaccine or serum for the infection. Convalescent serum has been tried by Adamy<sup>12</sup> and others, but showed no results that could be classed as curative or even beneficial.

The writer, feeling that a positive leukocytic response would be of benefit, used massive doses of leukocytic extract, prepared by the Archibald method, to excite this response. It was useless in small doses; but five cubic centimeters given hypodermically or intramuscularly every four hours, night and day, seemed to influence the disease remarkably. Any vaccine, serum or other agent which irritates the reticulo-endothelial beds, is worthy of a trial. English authors report results with antimeningococcic serum and typhoid vaccine.

A mixture of quinin and camphor in vegetable oil was used intramuscularly, but without appreciable benefit to the pneumonia.

The nose may need care due to the perichondritis that sometimes develops. Use either zinc oxid ointment, in a collapsible tube with nasal tip, or yellow vaselin, and allow it to remain in the nares as long as possible. White vaselin is bleached and is liable to cause irritation if placed in the nose. An antiseptic of a mild nature, like those prepared in water-soluble jellies, can occasionally be used with benefit.

Convalescence has to be very carefully considered, as relapses are common and phlebitis is likely to develop. The patient should live quietly, and without physical exertion or labor, for at least thirty days after the temperature drops, if the case has been a severe one. After this the exercise and labor should be very gradually resumed, and even then a relapse may occur.

Although there may be leg weakness, with atrophy of the leg muscles, massage must be avoided due to the danger from thrombosed vessels.

#### PROGNOSIS

Certain factors must be considered in the prognosis of this disease and one of these is age. In the 675 cases reviewed, the age incidence was as follows:

Age susceptibility	Death Rate
1 to 10—approximately 1.5 per cent.....	Low
10 to 20—approximately 5 per cent.....	Low
30 to 50—approximately 60 per cent.....	50 per cent
50 to 60—approximately 15 per cent.....	50 per cent

Although the death rate was unobtainable in the above cases under thirty years of age, the younger patients are considered as having much better chances of recovery than those above thirty years. The death rate throughout the world approximates 40 per cent for all ages; in California, 20 per cent, or 9 out of 43 cases, of which 13 were males and 30 females.

Functionally, the surviving patients ultimately become normal, but some have an atrophy of the leg muscles with weakness, while others have a clouded mentality for some time.<sup>†</sup>

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<sup>†</sup> See, also, article in this issue on "Psittacosis in Germany and Holland in 1934," page 131.

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NOTE.—The newspapers of April 28, 1934, announced that Rivers of the Rockefeller Institute had succeeded in preparing an immunizing vaccine from filterable virus of psittacosis, and had injected some workers at the institute. No definite information is as yet obtainable on the subject.

#### DISCUSSION

GEORGE H. ROTH, M. D. (Director, Bureau of Communicable Disease Control, Los Angeles County Health Department, Los Angeles).—On December 5, 1929, the Lassco steamship "City of Los Angeles," with a number of passengers who had acquired Rio de Janeiro parrots while on a South American cruise, docked in Los Angeles Harbor.

On December 8, a member of the crew presented his parents in Alhambra with one of these parrots, which died in a few days. Both parents subsequently developed psittacosis, which proved fatal to the mother.

A customs officer at the harbor, through his association with the parrots, contracted psittacosis and died.

A member of a very prominent family in Los Angeles, who was a passenger on the steamship, purchased a parrot in Rio de Janeiro, and proceeded on to Honolulu, where she died from psittacosis.

This was our first recorded outbreak of psittacosis in California—six cases, with three deaths.

On January 17, 1930, we went to the "City of Los Angeles" dock at Wilmington harbor, and procured the passenger list of those that disembarked with Rio parrots. On this list were people from Los Angeles, Beverly Hills, Pasadena, Alhambra, Los Angeles County and several eastern cities. These were all followed up and several suspects located. There were several instances in which a parrot died, and shortly after "influenza or pneumonia" developed in members of the household. In one case a priest who had taken the cruise brought a Rio parrot to his home in Toledo and gave it to his housekeeper. Subsequently the parrot died from "too drastic a change in climate," the father assured me. Two weeks later the housekeeper died of "pneumonia."

On January 25, 1930, the Surgeon-General issued orders for "Exclusion of all parrots, and suitable detention of all parrots on board any ship arriving from a foreign port." We have had no further outbreaks of psittacosis from parrots.

**Outbreaks from Parrakeets.**—We cannot, however, say so much for the parrakeets. Southern California climate proved unusually favorable for their propagation, so within a short time a large and thriving industry developed, the greatest concentration (60 per cent) being in Los Angeles County. Love-birds were not only freely dispensed locally, but interstate trade was engaged in to a considerable extent and with some very disastrous results.

In the fall of 1931 an itinerant vendor purchased a number of love-birds from two of the large aviaries in Los Angeles, and headed north over the Ridge Route and up through the Central valleys, leaving a trail of psittacosis and death in his wake in five counties—ten cases and five deaths.

Another vendor from San Francisco was responsible for four cases with one death in three counties. There were cases in Bell, Huntington Park, Pasadena and the city of Los Angeles traceable to local parrakeets. Thus, foci of infection were proven in Southern California, particularly in Los Angeles County and also in San Francisco; but these were presumed to be from imported parrakeets, so on February 13, 1932, the California State Department of Public Health issued an order prohibiting importation of all psittacine birds for a period of six months.

The development of all these cases caused an extensive epidemiological investigation to be made, and in the course of studies on human cases it was determined by laboratory tests that psittacosis had become endemic in California aviaries. All infected aviaries were, of course, quarantined. Repeated efforts of the

State Department of Public Health to effect regulatory measures to stop the spread of this disease were met with such strenuous opposition from a majority of the aviary owners, many of whom do not recognize the existence of psittacosis, that little could be accomplished in the way of control measures.

Up to this time—October, 1932—there were fifty-four cases with ten deaths in this state, and outbreaks in eight other states as follows, all traced to California parakeets:

New York, November, 1931.....	3 cases	1 death
Oregon, November, 1931.....	2 cases	2 deaths
	(5 suspects)	
Illinois, July, 1932.....	3 cases	1 death
Michigan, August, 1932.....	1 case	1 death
Minnesota, September, 1932.....	12 cases	1 death
Massachusetts, October, 1932.....	2 cases	1 death
Wisconsin, October, 1932.....	9 cases	0 deaths
Idaho, October, 1932.....	1 case	recovered

—and that one case happened to be the wife of United States Senator Borah.

Then things began to happen in Washington. The Surgeon-General issued an order prohibiting the interstate transportation by common carrier of birds of the parrot family, and provided that they could be released for interstate shipment only after being certified by the State Department of Public Health. Very few could be certified and a quarantine was placed on all others; consequently most of the traffic in parakeets ceased.

As the industry was practically tied up under federal and state regulations, the aviary owners assumed a more cooperative attitude, and definite regulatory measures were instituted.

Breeders were required to maintain at least three pens separated by a distance of five feet. The first pen was maintained for breeding purposes only; the second for maturing the birds to the age of seven months, at which time they were given a leg-band on which was stamped the registration number and code number of the owner, and placed in the third isolation pen for a period of thirty days. At the end of this period, the birds were inspected and a certificate of health given for their release. This procedure seemed very effective as there were no cases of human psittacosis from October, 1932, when the lid was clamped down to February, 1933.

Suddenly, however, in the spring of 1933 there occurred five cases in Los Angeles County in rapid succession, four of which were fatal, all traceable to different sources of infection. Later in the year psittacosis outbreaks occurred in Maine, Connecticut and Hawaii. However, it can be said to the credit of the California health authorities, that all cases occurring outside of California during 1933 appear to have been contracted from birds that were shipped from California in violation of regulations of the State Department of Public Health. As a direct result of these irregularities which resulted in an order from the Acting Secretary of the Treasury of the United States, the California State Board of Health on February 10, 1934, ruled that in the future "no shipping certificates will be issued without a report from a laboratory duly designated for that purpose showing that 10 per cent of the shell parakeets have been examined by autopsy and laboratory tests on mice and found to be free from psittacosis infection, and further that no bird under eight months of age be offered or accepted." A branch of the State Laboratory was immediately established in Los Angeles and work was begun.

In the latter part of March of this year, the Pittsburgh outbreak of over twenty-five cases with eleven deaths occurred which was charged to California parakeets. This, of course, demanded drastic action; so on April 2, the director of the State Department of Public Health issued an order to the effect that shipping permits both for interstate and intrastate movement of parakeets be discontinued.

Thus we see the lid has again been clamped down tight, and we have reason to believe it will remain so

until such time as state and federal authorities complete control measures for adequate protection of public health.

The previous procedure, based on a system of segregation and inspection, while helpful, was inadequate as evidenced by the continuance of cases here and in other states. The recent plan of February 10, 1934, which provided for a 10 per cent laboratory test of all aviaries before certification, was regarded as insufficient. Therefore, a more stringent procedure with additional safeguards was formulated and adopted on April 24. This plan provides for a 10 per cent double laboratory check of aviaries before breeding is permitted. Then the young birds are put in separate pens and, when eight months old, are subjected to a 10 per cent laboratory test and, if found free from infection, are banded, coded and released. Affidavits have to be signed by the aviary owners to follow outlined procedure. All shipments have to be counted, and code numbers checked and many other details carried out. The program seems promising, provided sufficient personnel can be secured for its rigid enforcement. If not, there would seem to be but one alternative and that is complete extermination of psittacine birds, and disinfection of premises and equipment.

Then, if the public still demands parakeets, let the breeders start anew with clean stock. Many public health authorities believe the latter method would be cheaper and better in the long run. We all know how hoof and mouth disease was eradicated from the dairy herds of California. The psittacosis problem seems comparable. This procedure was strongly advocated by our most eminent authorities over two years ago and, had it been followed, the industry would now be restored, and there would have been a saving of many human lives.

## PLAGUE\*

By W. H. KELLOGG, M. D.  
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DISCUSSION by K. F. Meyer, Ph.D., San Francisco

THE history of plague as one of the five great epidemic diseases is too well known to require more than passing reference. The black death of the Middle Ages, responsible as it was for probably 25,000,000 deaths in a single century; the plague of Florence, for knowledge of which many are indebted to the Decameron of Boccaccio; and the great plague of London are interesting historically, and as chapters in the history of medicine, but it is not epidemics of this kind that we fear at the present time.

Our very thorough knowledge of the cause and mode of spread of this disease insures us against such devastating outbreaks as the 1663-65 plague of London; although the cost of controlling epidemics once they are started runs into the millions for any given community, as two of our California cities know to their sorrow. Probably the traditional ounce of prevention looms larger in importance in this disease than in most any other, for its control depends, not on individual effort as in smallpox, but on community measures. These measures are not the usual ones of general sanitation of the environment, which are so effective in controlling cholera, typhoid and yellow fever; but

\* From the State Hygienic Laboratory, Berkeley.

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